MYCOTAXON

ISSN (print) 0093-4666 (online) 2154-8889 Mycotaxon, Ltd. ©2018

July–September 2018—Volume 133, pp. 373–379

https://doi.org/10.5248/133.373

Rare or interesting lichen species new to China

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Abstract —During recent studies on the microlichens from Mount Taibai in Qinling Mountains of northwestern China, *Bryobilimbia hypnorum, Catillaria nigroclavata, Mycobilimbia tetramera, Placidiopsis pseudocinerea,* and *Toninia diffracta* were revealed as new records for China or mainland China. Illustrations and detailed taxonomic descriptions are provided for these five newly reported species.

Key words—*Ascomycota*, *Catillariaceae, Porpidiaceae*, *Ramalinaceae*, *Verrucariaceae*

Introduction

Mount Taibai, the highest mountain of the Qinling Range, is located in the southwest of the Shaanxi Province in China; its tallest point, the Baxian Tower, is 3767 m a.s.l. Due to its relatively high elevation, a typical vertical distribution of vegetation ranges can be observed. Thus, the Mount Taibai region houses plants from subtropical to warm temperate climates as well as some elements from middle temperate and alpine climates.

One hundred and sixty-three lichen species were reported from Mount Taibai by Guo (2005), and subsequently five new species of crustose lichens have been described from there (Ren 2013, 2014, 2017; Zhang & Ren 2016). Here we present five additional lichen records from Mount Taibai, of which four are new for China and one is new for the mainland. Illustrations accompany detailed morphological and chemical descriptions of the newly reported taxa.

Material & methods

The material was collected in the following vegetation types (see Liu & al. 2002): deciduous oak forests (with *Quercus variabilis, Q. aliena* var. *acutiserrata,* and *Q. liaotungensis;* 800–2300 m), birch forest (with *Betula albosinensis;* 2300–2730 m), coniferous forest zone (with *Abies fargesii, A. chinensis, A. sutchuensis,* and *Larix chinensis* [the latter forming the timber line]; 2730–3400 m), and *Kobresia*-dominated alpine meadows (3400–3700 m). The specimens examined are housed in the herbarium of Shandong Normal University, Jinan, China (SDNU). We examined the morphology using an Olympus SZ51 dissecting microscope and an Olympus CX21 compound light microscope and determined lichen secondary metabolites by spot test reagents and standardized thin-layer chromatography (TLC) with solvents A, B, & C (Elix 2014). Photographs were taken using an Olympus SZX16 stereomicroscope with a DP72 digital camera.

Taxonomy

Bryobilimbia hypnorum (Lib.) Fryday, Printzen & S. Ekman, Lichenologist 46: 31 (2014). Fig. 1

Thallus crustose, thin, grey. Photobiont green, globular, cells 10–17 µm diam.

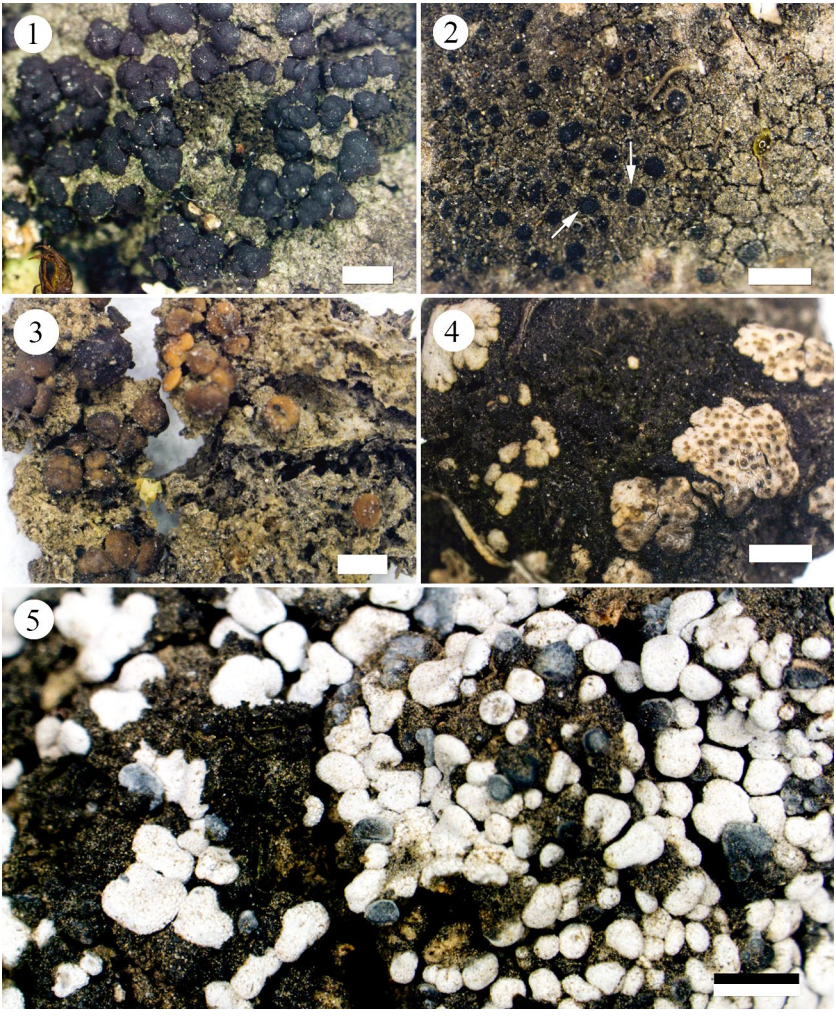
Apothecia single or sometimes clustered, dark brown to black, 0.5–1.1 mm diam.; disk flat to convex; exciple dark red-brown and persisting; epithecium pale brown; hymenium colorless, 75–87.5 µm tall; hypothecium dark red-brown, hymenium and hypothecium with blue-violet granules (K+ green); paraphyses 1–1.5 µm diam., simple, apices <2.5 µm diam., without dark brown cap; asci 8-spored, of the *Porpidia*-type; ascospores 1(–3)-septate, with warted epispore, colorless, ellipsoid, 12–16.5(–18) × 5.5–6 µm. Pycnidia not seen.

Chemistry: Thallus K–, C–, KC–, PD–. No lichen substances detected by TLC.

Specimen examined: **CHINA. Shaanxi: Meixian County**, Mount Taibai, on the roadside between Xiao Wengong Temple and Wengong Temple, alt. 3448 m, on moss, 12 Sep. 2017, Q. Ren 5105 (SDNU).

Comments: *Bryobilimbia hypnorum* is a new record for China. Our Chinese specimen is closely similar to the specimens described by Fryday & al. (2014), which were characterized by a muscicolous thallus with single to clustered apothecia, blue-violet granules in the hymenium, 8-spored asci of the *Porpidia*-type, and colorless, often 1-septate ascospores with a very finely warted epispore.

Bryobilimbia sanguineoatra (Wulfen) Fryday & al. differs from *B. hypnorum* by its narrower ascospores (3–4.5 µm diam.; Fryday & al. 2014).



Figs. 1–5. 1. *Bryobilimbia hypnorum,* thallus habit; 2. *Catillaria nigroclavata,* thallus habit (white arrows point to black apothecia); 3. *Mycobilimbia tetramera,* thallus habit; 4. *Placidiopsis pseudocinerea,* thallus habit; 5. *Toninia diffracta,* thallus habit. Scale bars: 1–3 = 1 mm; 4, 5 = 2 mm.

Catillaria nigroclavata (Nyl.) J. Steiner, Sitzungsber. Kaiserl. Akad. Wiss., Wien., Math.-Naturwiss. Cl., Abt. 1, 107: 157 (1898). Fig. 2

Thallus crustose, thin, grey-brown, often inconspicuous, without a distinct margin. Verrucae granular, 0.04–0.1 mm diam. Soredia and isidia absent. Photobiont chlorococcoid; cells 10–12.5 µm diam.

Apothecia sessile, flat, black, 0.15–0.3 mm diam.; margin slightly raised, concolourous with disk; exciple brown at outer edge, colorless to pale brown at inner edge; epithecium brown, K–, N–; hymenium colorless, 37.5–42.5 μm tall; hypothecium pale brown; paraphyses 1–1.5 μm diam., simple or sparsely branched; apices swollen to 4 μm diam., with dark brown caps; asci 8-spored, of the *Catillaria*-type; ascospores 1-septate, colorless, ellipsoid, 7.5–11 × 2.5–3 μm. Pycnidia not seen.

Chemistry: Chemistry unknown.

Specimens examined: **CHINA. Shaanxi: Meixian County**, Mount Taibai, alt. 2250 m, on bark, 16 Jun. 2011, Y. Dong 20114251 (SDNU); alt. 2400 m, on bark, 16 Jun. 2011, Y.L. Cheng 20114329C-1 (SDNU).

Comments: *Catillaria nigroclavata,* previously reported from Taiwan (Aptroot & Sparrius 2003), is here newly recorded from mainland China. Our specimens closely resemble those described by Fletcher & Coppins (2009), characterized by a corticolous thallus, paraphyses with swollen apices and a dark brown apical cap, an exciple with a brown outer edge, and 8-spored *Catillaria*-type asci.

Catillaria nigroclavata resembles *C. chalybeia* (Borrer) A. Massal. and *C. lenticularis* (Ach.) Th. Fr., but *C. chalybeia* has slightly larger apothecia (0.2–0.5 mm) and usually green pigments in the hymenium, and *C. lenticularis* differs by its saxicolous thallus and convex apothecia (Fletcher & Coppins 2009).

Mycobilimbia tetramera (De Not.) Vitik., Ahti, Kuusinen, Lommi & T. Ulvinen ex Hafellner & Türk, Stapfia 76: 148 (2001). Fig. 3

Thallus crustose, thin or rather thick, grey-brown, coarsely granular or warted, without a distinct margin. Photobiont chlorococcoid.

Apothecia single, disc flat to slightly concave at first, becoming slightly convex when mature, grey-brown, orange-brown, or red-brown, 0.5–1.2 mm diam.; margin concolourous with disc or paler, at first distinct, level with disc, soon excluded and reflexed; exciple pale yellow, K+ intensifying, c. 62.5–90 μm diam.; epithecium slightly brown; hymenium colorless, 77.5–100 μm high; paraphyses simple or rarely branched, 1–1.5(–2) μm diam., apices slightly swollen; hypothecium colorless, or pale yellow, K+ intensifying; asci 8-spored, cylindrical, of the *Biatora*-type; ascospores colorless, 3-septate, fusiform, straight, 17.5–21 × 5–6 μm. Pycnidia not seen.

Chemistry: Thallus K–, C–, KC–, PD–. No lichen substances detected by TLC.

Specimen examined: **CHINA. Shaanxi: Meixian County**, Mount Taibai, Mingxing Temple, alt. 2900 m, on mosses over rock., 4 Aug. 2005, Y.J. Li & W. Fu L-179 (SDNU).

Comments: *Mycobilimbia tetramera* is a new record for China. Our specimen closely resembles those described by Printzen & al. (2009), which were characterized by a coarsely granular or warted thallus on mosses over rock, grey- to red brown apothecia, 8-spored *Biatora*-type asci, and 3-septate ascospores.

Mycobilimbia tetramera is very similar to *M. carneoalbida* (Müll. Arg.) S. Ekman & Printzen and *M. epixanthoides* (Nyl.) Vitik. & al., but *M. carneoalbida* has whitish to pale orange-brown apothecia and shorter hymenium (65–75 µm), and *M. epixanthoides* differs by its sorediate thallus and infrequent apothecia (Printzen & al. 2009).

Placidiopsis pseudocinerea Breuss, Pl. Syst. Evol. 142: 248 (1983) Fig. 4

Thallus squamulose; squamules ≤4.2 mm across, closely appressed, scattered, pale brown, underside black. Photobiont green, cells globular, 7.5–10 µm diam.

Perithecia fully immersed, 0.2–0.32 mm diam., ostioles dark, ±elevated; true exciple colorless to black-brown; asci 8-spored, biseriate; ascospores 1-septate, colorless, ellipsoid, 15–17.5(–20) × (7–)7.5–8(–8.5) µm. Pycnidia not seen.

Chemistry: Thallus K–, C–, KC–, PD–. No lichen substances detected by TLC.

Specimens examined: **CHINA. Shaanxi: Meixian County**, Mount Taibai, Xiao Wengong Temple, alt. 3480 m, on soil, 11 Sep. 2017, Q. Ren 4719 (SDNU); Wengong Temple, alt. 3530 m, on soil, 12 Sep. 2017, Q. Ren 4909 (SDNU).

Comments: *Placidiopsis pseudocinerea* represents a new record for China. Our specimens closely resemble those described by Breuss (2009) in producing a squamulose thallus on soil, scattered squamules c. 4 mm in diam., fully immersed perithecia, and 8-spored asci with 1-septate ascospores.

Placidiopsis pseudocinerea resembles *Catapyrenium cinereum* (Pers.) Körb., which differs by its smaller squamules (rarely >2 mm), and its simple and longer (17–23 µm) ascospores (Breuss 2009).

Toninia diffracta (A. Massal.) Zahlbr., Oesterr. Bot. Z. 51: 284 (1901). Fig. 5

Thallus squamulose, squamules scattered at first, becoming contiguous, weakly convex to hemispherical when mature; upper surface white-grey,

densely white-pruinose, pruina granular; the edges concolourous with upper side, the underside white to pale brown, 0.8–2 (–2.5) mm diam. Photobiont chlorococcoid; cells yellow-green, globular, 9–12 µm diam.

Apothecia 0.8–1.5(–2) mm diam., single, slightly concave to convex, black covered by white pruina; margin concolourous with disc; exciple brown, K+ violet, N+ violet; epithecium grey, K+ violet, N+ violet; hymenium colorless to slightly brown, 75–87.5 µm tall; paraphyses simple or rarely branched, 1.5–2.5 µm diam., apices swollen to 5 µm diam.; hypothecium brown, 50–62.5 µm tall; asci 8-spored, cylindrical, of the *Biatora*-type; ascospores colorless, 1-septate, fusiform, 15–20 × 3–4 µm. Pycnidia not seen.

Chemistry: Thallus K–, C–, KC–, PD–. No lichen substances by TLC.

Specimen examined: **CHINA. Shaanxi: Meixian County**, Mount Taibai, Wengong Temple, alt. 3660 m, on soil, 5 Aug. 2005, Y.J. Li & W. Fu L-390 (SDNU).

Comments: *Toninia diffracta* represents a new record for China. Our specimen is closely similar to those described by Hitch & al. (2009), which were characterized by a squamulose thallus on soil, scattered to contiguous white-pruinose squamules, grey epithecium K+ violet, 8-spored *Biatora*-type asci, and 1-septate ascospores.

Toninia diffracta is very similar to *T. candida* (Weber) Th. Fr., which differs by its farinose pruina, a continuous rosette-shaped thallus, and always lacks regular fissures in the cortex (Hitch & al. 2009).

Acknowledgements

This project is supported by the National Natural Science Foundation of China (31370066, 31750001) and the Excellent Young Scholars Research Fund of Shandong Normal University. We are very grateful to Dr. Walter Obermayer (Institute of Biology, University Graz, Austria) and Dr. Shouyu Guo (Institute of Microbiology, CAS, China) for reviewing the manuscript.

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